Remarks

Claims 1-4 and 6-10 were rejected under 35 U.S.C. § 112, first paragraph, as not complying with the written description requirement, although it is phrased as failing to demonstrate that the applicants had the claimed invention in their possession at the time the application was filed. Claims 1-4 and 6-10 were rejected under 35 U.S.C. § 112, first paragraph, as not being enabled for a method of producing polyhydroxyalkanoates from hydroxyalkanoates using any or all diol oxidoreductases, any or all aldehyde dehydrogenases in any plants by converting any diols to hydroxyalkanoates. Applicants respectfully traverse these rejections.

Rejection Under 35 U.S.C. § 112, first paragraph, enablement

The Claimed Invention

The claims of the present application define methods and systems for producing polyhydroxyalkanoates comprising providing organisms with polynucleotides that encode enzymes, which are active in bacteria or plants, selected from diol oxidoreductase and aldehyde dehydrogenase, wherein the enzymes expressed by the organisms can convert diols into hydroxyalkanoate monomers.

The specification and the prior art disclose organisms that can be genetically engineered to produce PHAs (see at least page 5, lines 18-21), diols that may be utilized to form the claimed hydroxyhexanoate monomers (see at least page 9, lines 15-25), and organisms from which diol oxidoreductase and aldehyde dehydrogenase genes have been isolated and how to obtain these genes and enzymes (see at least page 6, lines 2-28 and Example 1). Methods for cloning genes encoding the enzyme are well known in the art and described in the application. For instance,

Example 1 discusses a standard method for cloning the *aldH* gene from the *E. coli* genome using PCR. Similar methods can be used to clone aldehyde dehydrogenase and diol oxidoreductase genes from other organisms without undue experimentation. There is also sufficient direction and guidance given by the specification to construct plasmids and express the claimed genes (see Examples). In addition, the Applicants have provided working examples which demonstrate that one can use the claimed enzymes to engineer organisms to produce polyhydroxyalkanoates from diols, such as 1,4-butanediol (see Examples 3, 4 and 7) and 1,3-propanediol (see Examples 5 and 6).

The Legal Standard

Applicants clearly set forth the standard for enablement in the Amendment and Responses filed February 2, 2005 and July 8, 2005. The fact that experimentation may be complex does not necessarily make it undue, if the art typically engages in such experimentation. *M.I.T. v. A.B. Fortia*, 774 F.2d 1104 (Fed. Cir. 1985). The Board of Patent Appeals and Interferences has held that claim language requiring operability may overcome a potential problem of a claim reading on a broad range of embodiments, many of which may be inoperative. *Ex parte Mark*, 12 USPQ2d 1904 (Bd. Pat. App. & Int'f 1989). As noted in *Ex parte Jackson*, the test for undue experimentation is not merely quantitative, since **a considerable amount of experiment is permissible, if it is merely routine,** or if the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed to enable the determination of how to practice a

desired embodiment of the invention claimed. See *Ex parte Jackson*, 217 USPQ 804, 807 (PTO Bd. App. 1982). There is no requirement for examples.

There is no legal requirement that all of the enzymes within the scope of the claims convert the diols to their corresponding hydroxyalkanoate monomers for the enzymes to have the specified utility. In *Atlas Powder Co. v. E.I. du Pont de Nemours & Co.* (1984), the Federal Circuit noted that "Even if some of the claimed combinations were inoperative, the claims are not necessarily invalid ... [I]f the number of inoperative combinations becomes significant, and in effect forces one of ordinary skill in the art to experiment unduly in order to practice the claimed invention, the claims might indeed be invalid." *Atlas Powder Co. v. E. I. Du Pont de Nemours & Co.*, 750 F.2d 1569 (Fed. Cir.1984). It would only take routine experimentation, such as the screening methods described on page 7, line 24 to page 8, line 26, to identify other aldehyde dehydrogenases and diol oxidoreductases, for example, from the organisms recited on page 6, lines 3-28, that can convert the diols to their corresponding hydroxyalkanoates. Based on guidance provided in the specification and the state of the art, one of ordinary skill in the art would be able to select an appropriate aldehyde dehydrogenase or diol oxidoreductase for use in the claimed methods and systems.

Analysis

Even if the examiner has provided a rational basis for making a prima facie case that the claims are not enabled (which is believed not to be the case since all the examiner has provided is argumentation, not support for the rejection), Applicants have provided sufficient evidence in

the Amendment and Responses filed February 2, 2005 and July 8, 2005 to overcome all of the Examiner's concerns.

In the Office Action mailed September 21, 2005, the Examiner again simply restates his arguments without considering the evidence provided by the Applicants. Furthermore, the Examiner has not provided Applicants with any evidence to contradict Applicant's evidence supporting enablement of the claims. *This is legal error.* Once the applicants' have rebutted the rejection with evidence, the examiner must provide a basis, not argumentation, for why the rejection has been maintained. *The examiner has failed to do so.*

The Examiner argues that the claims are not enabled for any or all diol oxidoreductases, any or all aldehyde dehydrogenases in any plants by converting any diols to hydroxyalkanoates. *This is not the legal requirement. The legal requirement is not to prove enablement for each and every species that may fall within the scope of the claim.* However, the claims define enzymes that can convert diols into hydroxyalkanaote monomers. Therefore, the claims do not encompass enzymes that would not work and one of ordinary skill in the art would **not** select an enzyme that cannot perform this function.

It clear from the amount of direction or guidance presented in the specification, the presence of working examples, the state of the prior art, the relative skill in the art, and the breadth of the claims that one of ordinary skill in the art would be able to make and use the claimed genetically engineered organisms for the production of polyhydroxyalkanoates without undue experimentation.

Rejection Under 35 U.S.C. § 112, first paragraph, written description

The claimed invention is discussed above.

The Legal Standard for Written Description

To satisfy the written description requirement under 35 U.S.C. 112, first paragraph, a patent specification must describe the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention at the time of filing. *See, e.g. Vas-Cath, Inc. v. Mahurkar*, 935 F.2d at 1563, 19 USPQ2d at 1116. (MPEP 2163 I.).

"There is a strong presumption that an adequate written description of the claimed invention is present in the specification as filed". *Wertheim*, 541 F.2d at 262, 191 USPQ at 96 (CCPA 1976). The written description requirement for a claimed genus may be satisfied through a sufficient description of a representative number of species by actual reduction to practice, reduction to drawings, or by disclosure of relevant identifying characteristics, i.e. structure or other physical and/or chemical properties, by functional characteristics coupled with a known or a disclosed correlation between function and structure, or by a combination of such identifying characteristics, sufficient to show the applicant was in possession of the claimed genus. See *Eli Lilly*, 119 F.3d at 1568, 43 USPQ2d at 1406.

A "representative number of species" means that the species which are adequately described are representative of the entire genus. Thus when there is substantial variation within the genus, one must describe a sufficient variety of species to reflect the variation within the

genus. On the other hand, there may be a situation where one species adequately supports a genus. See, e.g., *Rasmussen*, 650 F.2d at 1214, 211 USPQ at 326-27.

In the patent context, not all functional descriptions of genetic material necessarily fail as a matter of law to meet the written description requirement; rather, the requirement may be satisfied if, in the knowledge of the art, the disclosed function is sufficiently correlated to a particular, known structure. *Amgen v. Hoechst Marion Roussell* 314 F.3d 1313 (Fed.Cir. 2003).

Analysis

The main crux of the Examiner's arguments appears to be that the claims encompass diol oxidoreductases and aldehyde dehydrogenases that **may** not work. However, the Examiner has provided no evidence that the methods and systems of the claims do not work nor does this unsupported argument have anything to do with complying with the written description requirement. The Applicants have provided ample support demonstrating that the claims of the present application meet the written description requirement. The Examiner alleges that the genus comprising aldehyde dehydrogenase and the genus comprising diol oxidoreductase comprises species that are structurally unrelated and utilize substrates unrelated to the diols recited in the claims. However, the claims define only those enzymes that can convert diols into hydroxyalkanaote monomers and do not include enzymes that cannot use diols as substrates.

The written description requirement requires proof only that one of ordinary skill in the art could, or did, make and use the invention as described in the application. This is uncontroverted; the specification provides not only representative materials from a broad

spectrum of enzymes and substrates, but actual working examples. Therefore, applicants have complied with the written description requirement for the claimed method.

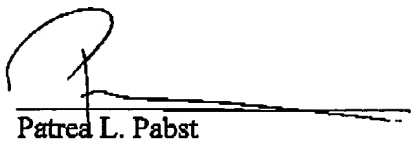
The examiner seems to confuse the requirement for claiming the enzymes *per se*, rather than a method of use that utilizes enzymes having a defined specificity. This is legally incorrect.

The specification and publications demonstrate that genes encoding aldehyde dehydrogenase and diol oxidoreductase were known and could be obtained from a number of organisms, as of the priority date of this application, July 21, 2000. Published amino acid and nucleotide sequence listings for the various genes could be obtained from GenBank or the National Center for Biotechnology Information (NCBI) and actual DNA could be obtained from the authors of the publications or purchased from commercial suppliers, such as the American Type Culture Collection (ATCC). Therefore, applicants have complied with the written description requirement.

U.S.S.N. 09/909,574
Filed: July 20, 2001
RESPONSE TO OFFICE ACTION

Allowance of claims 1-4 and 6-10 is respectfully solicited.

Respectfully submitted,



Patrea L. Pabst
Reg. No. 31,284

Date: December 21, 2005

PABST PATENT GROUP LLP
400 Colony Square, Suite 1200
1201 Peachtree Street
Atlanta, Georgia 30361
(404) 879-2151
(404) 879-2160 (Facsimile)